

Flambeau Mining Company

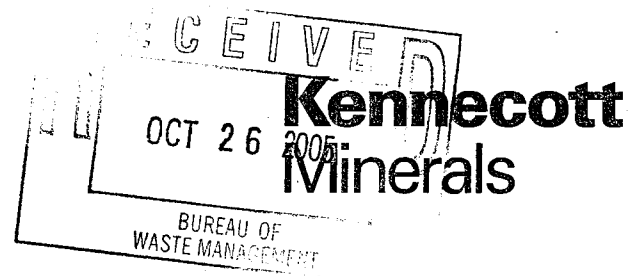
N4100 Highway 27

Ladysmith, WI 54848

(715) 532-6690

FAX (715) 532-6885

October 24, 2005



Mr. Lawrence J. Lynch
Mine Reclamation Unit
Bureau of Solid and Hazardous Waste Management
101 S. Webster Street, GEF II
PO Box 7921
Madison, WI 53707

Dear Mr. Lynch:

RE: Stream C – 2005 Analysis of Collected Data
Flambeau Mining Company

On August 5, 2004, Flambeau Mining Company (Flambeau) provided to the Wisconsin Department of Natural Resources (WDNR) a work plan for monitoring Stream C. In a letter dated January 20, 2005 Flambeau provided to the WDNR data from monitoring Stream C during 2004. The WDNR provided comment in a letter dated March 22, 2005. During 2005, Flambeau has sampled surface water and sediment in general conformance to the March 2005 letter.

Foth & Van Dyke prepared the attached memorandum dated October 10, 2005 that summarizes and assesses the data that have been collected in 2005.

In summary, Stream C is an intermittent stream with poor aquatic habitat that lacks aquatic vegetation and aquatic macroinvertebrates. As a result of the poor habitat and very limited food source, no fish were observed in the stream during the 2004 & 2005 biological assessments. Stream C does not possess the types of characteristics that are needed for it to support any type of fishery over a long (season) length of time.

The sediment sampling of the biofilter indicates that the biofilter is functioning as designed. This is supported by the fish and amphibians that have been observed in the biofilter.

The surface water sampling that has been completed within the watershed of Stream C suggests that some areas, particularly those affected by highway runoff, may naturally exhibit elevated copper levels in the water. In addition, the sampling indicates that there

Mr. Lawrence J. Lynch

October 24, 2005

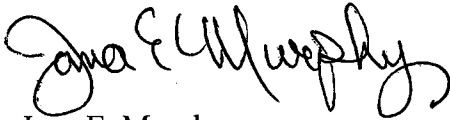
Page 2

appear to be localized areas at the industrial outlot that may be contributing elevated copper levels to storm water that passes through the biofilter.

Based on this last point, Flambeau is prepared to implement measures to minimize stormwater contacting the localized areas that may be contributing to the elevated copper levels. Soil samples have been collected and tested for the parameters of interest. Sampling methods, results and a reclamation plan for the localized areas will be forthcoming to the WDNR for review.

If you require further information, please contact me at 715-532-6690 Ext. 2 or jana-murphy@clearwire.net.

Sincerely,



Jana E. Murphy

Environmental & Reclamation Manager

Attachment

Distribution:

Al Christianson, City of Ladysmith
Fred Fox, Kennecott Minerals
Hank Handzel, DeWitt, Ross & Stevens
Jim Hutchison, Foth & Van Dyke
Jon Kleist, WDNR Ladysmith
Ken Markart, WDNR Rhinelander
Tom Portle, WDNR Madison
Randy Tatur, Rusk County Chairman
Tom Riegel, Town of Grant
Mark Steward, Rusk County Zoning

Foth & Van Dyke Memorandum

October 10, 2005

TO: Jana Murphy, Flambeau Mining Company

CC: Master File – 04F003-5000

FR: Steve Donohue
James Hutchison

RE: Stream C – 2005 Analysis of Collected Data

Flambeau Mining Company (Flambeau) provided to the Wisconsin Department of Natural Resources (WDNR) data from monitoring Stream C at the reclaimed Flambeau Mine site in a letter dated January 20, 2005. The department provided comment to the letter in a letter dated March 22, 2005. Flambeau has sampled surface water and sediment in general conformance to the March 2005 letter.

The purpose of this memorandum is to summarize and assess the data that have been collected in 2005. Sampling points are located in Figures 1 and 2.

Biological Assessment of Stream C

Included in Attachment A is a copy of the 2005 Stream C biological assessment that was completed by Blue Iris Environmental, Inc. The assessment was completed on May 24 & 25, 2005. The 2005 biological assessment is a complimentary assessment to the assessment performed on August 17 & 18, 2004. The assessments documented that:

- ◆ The majority of the stream lacks any type of aquatic vegetation.
- ◆ Very few macroinvertebrates species were present in the stream and the macroinvertebrate population appears very sparse.
- ◆ No fish were present in the stream (this is likely due to the lack of suitable habitat, vegetation and macroinvertebrate population).
- ◆ While no fish were present in Stream C, fish and amphibians were present in the biofilter at the Flambeau Mine Site. (Note: after a high rainfall event during 2005, a couple of small minnows were observed in Stream C, possibly out-washed from the biofilter).

Blue Iris concluded that Stream C appears to be very limited in biota in all aspects including aquatic vegetation, macroinvertebrate populations and fish because of the variability in seasonal flow. Note that Stream C appears to convey water only during periods of precipitation and snow

melt, thus stream hydrology is likely to be the dominant factor controlling biological activity in the stream which is limited at best.

Stream C Hydrology

Table 1 summarizes measurements of depth to water at sandpoints installed in the bed of Stream C. The depth to water inside the sandpoint and outside the sandpoint was measured. A condition where the water level in the intermittent stream is higher than the water level in the pipe (depth to water outside the pipe is less than depth to water inside the pipe) demonstrates downward gradients where the stream is losing water to the surrounding shallow aquifer. Conversely, a condition where the water level in the stream is less than the water level in the pipe (depth to water outside the pipe is greater than the depth to water inside the pipe) demonstrates upward gradients whereby shallow groundwater is flowing into the stream. As indicated in Table 1, with the exception of Sandpoint 1, Stream C is consistently losing water to the shallow aquifer and would thus be characterized as a losing stream.

Stream C flow measurements during two events, (4/26/05 and 6/09/05), are summarized in Table 2. During August and September, no flows were observed in Stream C. Qualitative flows at points around the Outlot area during these events are summarized in Table 3. The locations of the qualitative flow descriptions are shown in Figure 2. The flow rates within Stream C varied from 0.09 cubic feet per second (cfs) to 1.2 cfs. Stream C is an intermittent system of limited hydrologic significance.

Biofilter Sediment Sampling Results

Sediment samples were collected from the biofilter on September 10, 2004 through September 9, 2005 during 5 rounds of sampling and analyzed for total copper, total zinc, sulfate and sulfide. The sulfide levels in the sediment samples were nominal, either below the laboratory limit of quantification (LOQ) or just above the LOQ. A copy of the laboratory reports are provided in Attachment B. Figure 1 summarizes the data on copper, zinc and sulfate levels in the biofilter sediments. As stated in the January report, the concentrations of these parameters, specifically copper, were higher in the sediment samples collected by the inlet to the biofilter. The biofilter sediment samples closer to the outlet exhibited much lower concentrations. These data trends indicate that the biofilter is functioning as planned and filtering out the suspended particulates. The higher total copper concentrations in the water that drains into the inlet of the biofilter (BFSW-C1) relative to the outlet (BFSW-C2), supports the conclusion that the biofilter continues to function as designed.

Surface Water Sampling

Extensive surface water sampling was completed as proposed in the August 5, 2004 work plan. Finalized laboratory reports have been obtained from the lab for the September and October 2004, and April, June, August and September 2005 monitoring events. During the August and September monitoring events, drought conditions prevented sampling at all locations. While stormwater runoff would reach the biofilter, flows from the biofilter were limited. Samples from BFSW-C2 during August and September were collected from within the biofilter pond since flows were minimal. These surface water sampling results are provided in Attachment C and are

summarized on Figure 2. Stream flow estimates are shown in Table 2. The following is noted based on the 2004 and 2005 sampling events:

- ◆ Elevated copper concentrations are evident in the influent to the biofilter and appear to be emanating most significantly from the exposed ground located outside the reclaimed mine permit area and within the industrial outlot that drains to sampling point BFSW-C1b. It should be noted that the sample collected at BFSW-C1B2 on August 26, 2005 does not represent typical stormwater quality from this location. A small sample collection sump was constructed within gravels appearing to contain residual sulfide bearing materials. This allowed the storm water sample to have a longer residence time especially during low flows.
- ◆ Elevated copper levels are also noted in samples SW-7 and SW-8, both of which are upstream of the confluence of Stream C and the biofilter outlet. Sampling point SW-8 receives runoff from areas that were, essentially not disturbed by the Flambeau mining operations and reclamation. Moreover, the concentration at SW-8 is greater than the biofilter outlet copper concentration. This suggests that background concentrations of copper at SW-8 are either naturally high or may be locally elevated due to runoff from State Highway 27 which runs adjacent to SW-8. The elevated copper levels at SW-7 are likely associated with the levels at SW-8 since water at SW-8 flows towards SW-7.

Summary and Recommendations

Stream C is an intermittent stream with poor aquatic habitat that lacks aquatic vegetation and aquatic macroinvertebrates. As a result of the poor habitat and very limited food source, no fish were observed in the stream during the 2004 & 2005 assessments. Stream C does not possess the types of characteristics that are needed for it to support any type of fishery over a long (season) length of time. The sediment sampling of the biofilter indicates that it is functioning as designed. This is supported by the fish and amphibians that have been observed in the biofilter. The surface water sampling that has been completed within the watershed of Stream C suggests that some areas, particularly those affected by highway runoff, may naturally exhibit elevated copper levels in the water. In addition, the sampling indicates that there appear to be localized areas at the industrial outlot that may be contributing elevated copper levels to storm water that passes through the biofilter. Based on this last point, Flambeau should consider implementing measures to minimize stormwater contacting the localized areas that may be contributing to the elevated copper levels. At Flambeau's request soil samples were collected by Foth & Van Dyke and tested by NLS for the parameters of interest. Sampling methods, results and recommended reclamation plan for the localized areas will be forthcoming for submittal to the WDNR.

Table 1
Stream C – Sandpoint Monitoring Data 2005
Water Level (measured from the top of the pipe)

Date	Sandpoint No.	Inside Pipe (ft)	Outside Pipe (ft)	Difference (ft)	Groundwater Gradient
04/26/05	1 ⁽¹⁾	0.86	2.38	-1.52	Upward
06/09/05	1 ⁽¹⁾	0.61	2.35	-1.74	Upward
08/27/05	1 ⁽¹⁾	1.52	2.52	-1.00	Upward
09/21/05	1 ⁽¹⁾	1.71	2.51	-0.80	Upward
04/26/05	2 ⁽²⁾	4.09	2.35	+1.74	Downward
06/09/05	2 ⁽²⁾	3.8	2.33	+4.07	Downward
08/27/05	2 ⁽²⁾	6.10	Dry	---	---
09/21/05	2 ⁽²⁾	6.10	Dry	---	---
04/26/05	3 ⁽³⁾	6.10	2.35	+3.75	Downward
06/09/05	3 ⁽³⁾	6.11	2.32	+3.79	Downward
08/26/05	3 ⁽³⁾	6.12	Dry	---	---
09/21/05	3 ⁽³⁾	6.11	Dry	---	---

Notes:

- (1) Sandpoint 1 is located near SW-C5
- (2) Sandpoint 2 is located in a mid-stretch of Stream C
- (3) Sandpoint 3 is located near SW-C6

Prepared by: JBH1
Checked by: REM

Table 2
Stream C Flow Monitoring Data

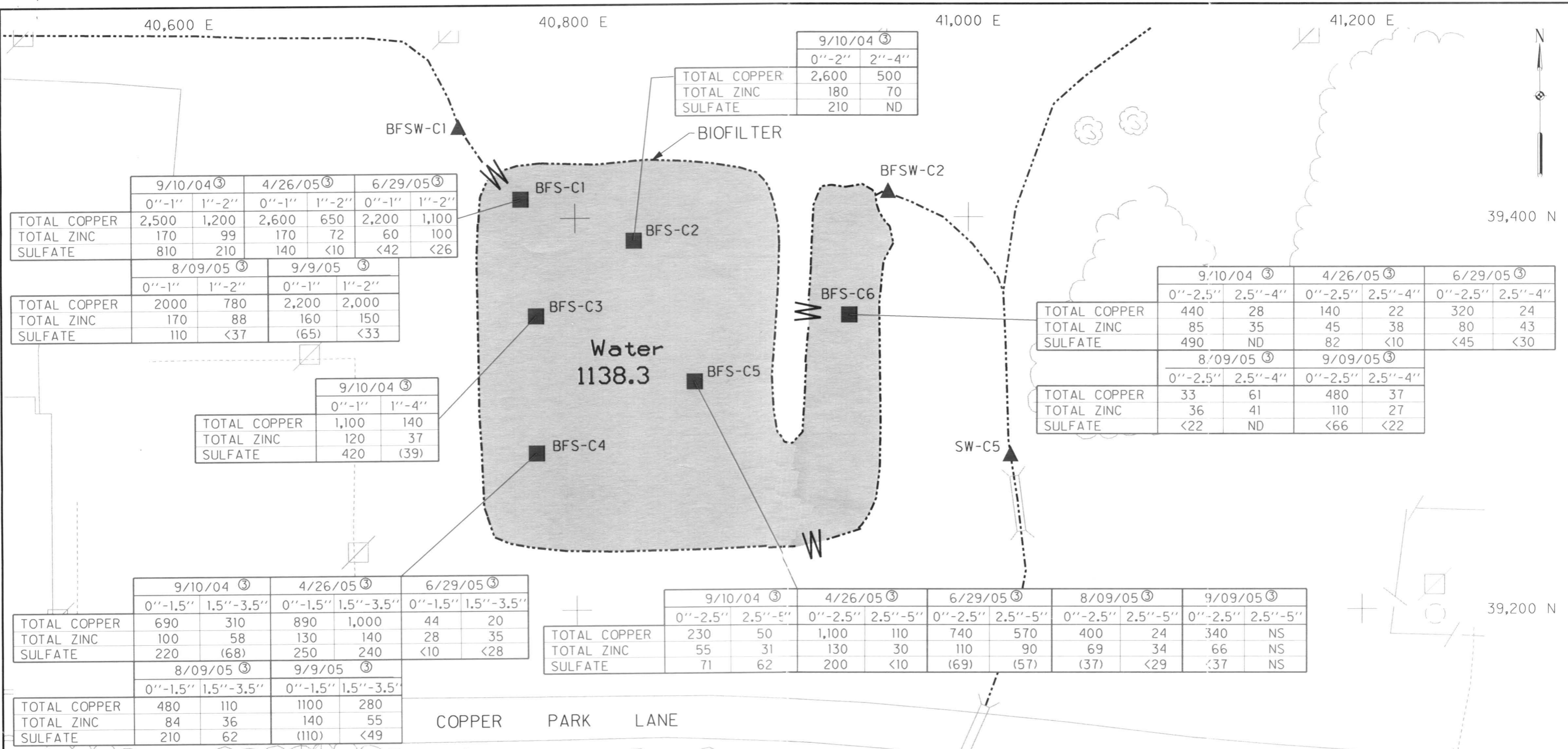
Station	Date	Discharge (cfs)
SP-1	4-26-05	0.10
SP-2	4-26-05	0.09
SP-3	4-26-05	0.14
SP-1	6-09-05	1.23
SP-2	6-09-05	0.19
SP-3	6-09-05	0.33
SP-1	8-27-05	Standing Water
SP-2	8-27-05	Dry
SP-3	8-26-05	Dry
SP-1	9-21-05	Standing Water
SP-2	9-21-05	Dry
SP-3	9-21-05	Dry

Prepared by: SRB
Checked by: JBH1

Table 3
Outlot Flow Observations – Stream C

Date	Location	Flow Observation
04/26/05	SW-C5	Very Low
04/26/05	BFSW-C2	Very Low
04/26/05	SW-C7	Very Low
04/26/05	SW-C8	Standing water; questionable flow
04/26/05	SW-C3	Standing water; questionable flow
04/26/05	SW-C4	Low Flow
06/09/05	SW-C5	Low to Mod; Culvert ½ full
06/09/05	BFSW-C2	Low Flow
06/09/05	SW-C7	Standing water; questionable flow
06/09/05	SW-C8	Standing water; questionable flow
06/09/05	SW-C3	Standing water; questionable flow
06/09/05	SW-C4	Moderate Flow
08/26/05	SW-C5	Dry
08/26/05	BFSW-C2	No Flow
08/26/05	SW-C7	Dry
08/26/05	SW-C8	Dry
08/26/05	SW-C3	Dry
08/26/05	SW-C4	Dry
09/20/05	SW-C5	Dry
09/20/05	BFSW-C2	No Flow
09/20/05	SW-C7	Dry
09/20/05	SW-C8	Dry
09/20/05	SW-C3	Dry
09/20/05	SW-C4	Dry

Prepared by: JBH1
Checked by: REM



	9/10/04 ③		4/26/05 ③		6/29/05 ③	
	0''-1''	1''-2''	0''-1''	1''-2''	0''-1''	1''-2''
TOTAL COPPER	2,500	1,200	2,600	650	2,200	1,100
TOTAL ZINC	170	99	170	72	60	100
SULFATE	810	210	140	<10	<42	<26

	8/09/05 ③		9/9/05 ③	
	0''-1''	1''-2''	0''-1''	1''-2''
TOTAL COPPER	2000	780	2,200	2,000
TOTAL ZINC	170	88	160	150
SULFATE	110	<37	(65)	<33

	9/10/04 ③	
	0''-1''	1''-4''
TOTAL COPPER	1,100	140
TOTAL ZINC	120	37
SULFATE	420	(39)

	9/10/04 ③	
	0''-2''	2''-4''
TOTAL COPPER	2,600	500
TOTAL ZINC	180	70
SULFATE	210	ND

	9/10/04 ③		4/26/05 ③		6/29/05 ③	
	0''-2.5''	2.5''-4''	0''-2.5''	2.5''-4''	0''-2.5''	2.5''-4''
TOTAL COPPER	440	28	140	22	320	24
TOTAL ZINC	85	35	45	38	80	43
SULFATE	490	ND	82	<10	<45	<30

	8/09/05 ③		9/09/05 ③	
	0''-2.5''	2.5''-4''	0''-2.5''	2.5''-4''
TOTAL COPPER	33	61	480	37
TOTAL ZINC	36	41	110	27
SULFATE	<22	ND	<66	<22

	9/10/04 ③		4/26/05 ③		6/29/05 ③	
	0''-1.5''	1.5''-3.5''	0''-1.5''	1.5''-3.5''	0''-1.5''	1.5''-3.5''
TOTAL COPPER	690	310	890	1,000	44	20
TOTAL ZINC	100	58	130	140	28	35
SULFATE	220	(68)	250	240	<10	<28

	9/10/04 ③		4/26/05 ③		6/29/05 ③		8/09/05 ③		9/09/05 ③	
	0''-2.5''	2.5''-5''	0''-2.5''	2.5''-5''	0''-2.5''	2.5''-5''	0''-2.5''	2.5''-5''	0''-2.5''	2.5''-5''
TOTAL COPPER	230	50	1,100	110	740	570	400	24	340	NS
TOTAL ZINC	55	31	130	30	110	90	69	34	66	NS
SULFATE	71	62	200	<10	(69)	(57)	(37)	<29	<37	NS

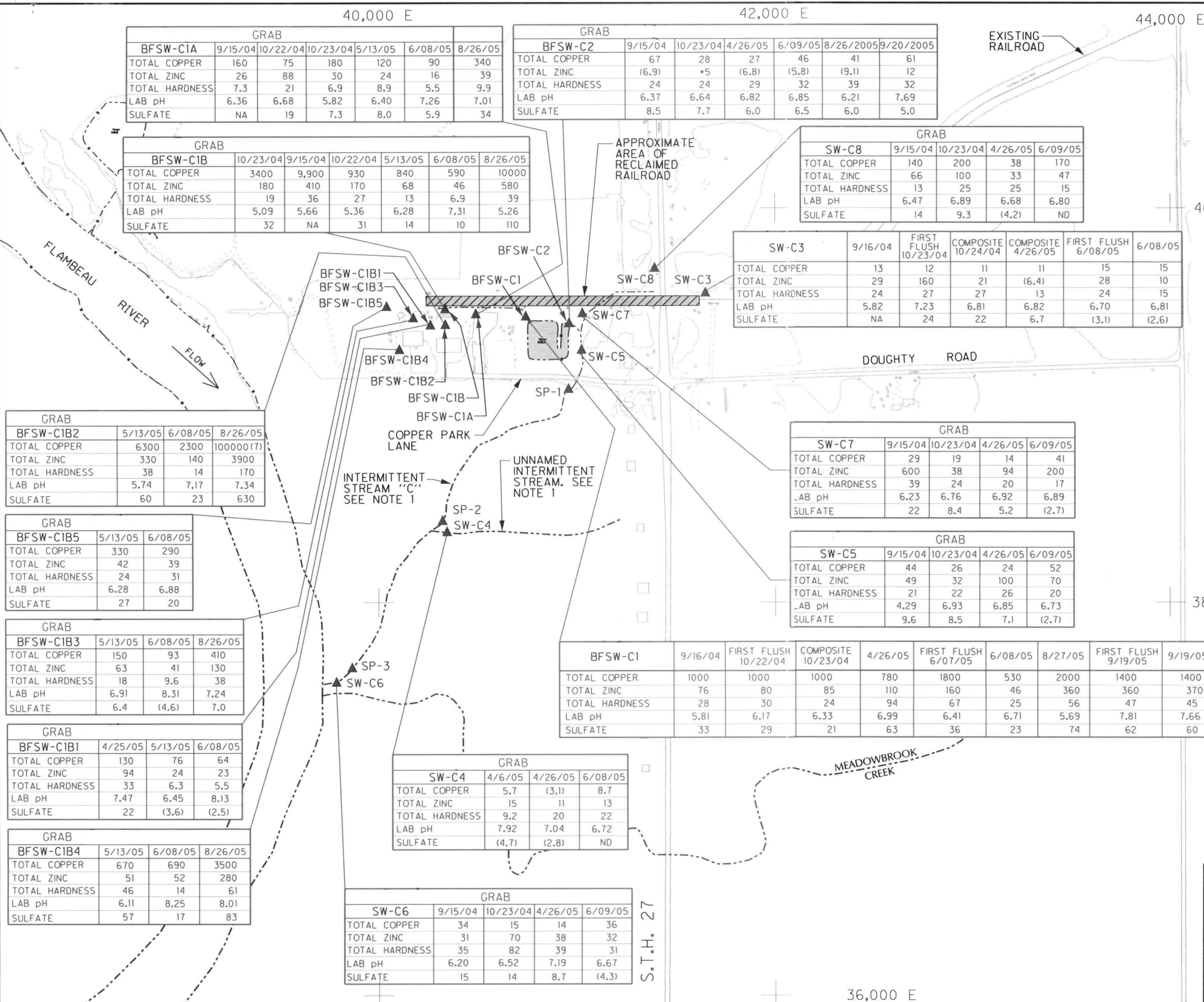
	8/09/05 ③		9/9/05 ③	
	0''-1.5''	1.5''-3.5''	0''-1.5''	1.5''-3.5''
TOTAL COPPER	480	110	1100	280
TOTAL ZINC	84	36	140	55
SULFATE	210	62	(110)	<49

LEGEND

- BFS-C3 ■ CORE SAMPLE LOCATION
- BFSW-C2 ▲ BIOFILTER ASSOCIATED SURFACE WATER MONITORING SITE NUMBER AND LOCATION (SEE FIGURE 2)

- NOTES:**
1. ZINC AND COPPER WATER CONCENTRATIONS IN µg/l. SULFATE AND HARDNESS WATER CONCENTRATIONS IN mg/l.
 2. VALUES IN PARENTHESIS ARE > OR = TO THE LOD BUT < THE LOQ.
 3. SEDIMENT SAMPLE CONCENTRATION FOR BFS-C1 THROUGH BFS-C6 ARE mg/kg ON A DRY WEIGHT BASIS (DWB).
 4. ND = NO DETECT; NS = NOT SAMPLED (INSUFFICIENT SEDIMENT)

FLAMBEAU MINING COMPANY		
FIGURE 1		
BIOFILTER SEDIMENT MONITORING RESULTS THRU SEPTEMBER 2005		
Scale:	Date: OCTOBER, 2005	
Prepared By: Foth & Van Dyke	By: DAT	04F003



GRAB						
BFSW-C1A	9/15/04	10/22/04	10/23/04	5/13/05	6/08/05	8/26/05
TOTAL COPPER	160	75	180	120	90	340
TOTAL ZINC	26	88	30	24	16	39
TOTAL HARDNESS	7.3	21	6.9	8.9	5.5	9.9
LAB pH	6.36	6.68	5.82	6.40	7.26	7.01
SULFATE	NA	19	7.3	8.0	5.9	34

GRAB						
BFSW-C2	9/15/04	10/23/04	4/26/05	6/09/05	8/26/2005	9/20/2005
TOTAL COPPER	67	28	27	46	41	61
TOTAL ZINC	(6.9)	*5	(6.8)	(5.8)	(9.1)	12
TOTAL HARDNESS	24	24	29	32	39	32
LAB pH	6.37	6.64	6.82	6.85	6.21	7.69
SULFATE	8.5	7.7	6.0	6.5	6.0	5.0

GRAB						
BFSW-C1B	10/23/04	9/15/04	10/22/04	5/13/05	6/08/05	8/26/05
TOTAL COPPER	3400	9,900	930	840	590	10000
TOTAL ZINC	180	410	170	68	46	580
TOTAL HARDNESS	19	36	27	13	6.9	39
LAB pH	5.09	5.66	5.36	6.28	7.31	5.26
SULFATE	32	NA	31	14	10	110

GRAB				
SW-C8	9/15/04	10/23/04	4/26/05	6/09/05
TOTAL COPPER	140	200	38	170
TOTAL ZINC	66	100	33	47
TOTAL HARDNESS	13	25	25	15
LAB pH	6.47	6.89	6.68	6.80
SULFATE	14	9.3	(4.2)	ND

GRAB						
SW-C3	9/16/04	FIRST FLUSH 10/23/04	COMPOSITE 10/24/04	COMPOSITE 4/26/05	FIRST FLUSH 6/08/05	6/08/05
TOTAL COPPER	13	12	11	11	15	15
TOTAL ZINC	29	160	21	(6.4)	28	10
TOTAL HARDNESS	24	27	27	13	24	15
LAB pH	5.82	7.23	6.81	6.82	6.70	6.81
SULFATE	NA	24	22	6.7	(3.1)	(2.6)

GRAB			
BFSW-C1B2	5/13/05	6/08/05	8/26/05
TOTAL COPPER	6300	2300	100000(7)
TOTAL ZINC	330	140	3900
TOTAL HARDNESS	38	14	170
LAB pH	5.74	7.17	7.34
SULFATE	60	23	630

GRAB		
BFSW-C1B5	5/13/05	6/08/05
TOTAL COPPER	330	290
TOTAL ZINC	42	39
TOTAL HARDNESS	24	31
LAB pH	6.28	6.88
SULFATE	27	20

GRAB			
BFSW-C1B3	5/13/05	6/08/05	8/26/05
TOTAL COPPER	150	93	410
TOTAL ZINC	63	41	130
TOTAL HARDNESS	18	9.6	38
LAB pH	6.91	8.31	7.24
SULFATE	6.4	(4.6)	7.0

GRAB			
BFSW-C1B1	4/25/05	5/13/05	6/08/05
TOTAL COPPER	130	76	64
TOTAL ZINC	94	24	23
TOTAL HARDNESS	33	6.3	5.5
LAB pH	7.47	6.45	8.13
SULFATE	22	(3.6)	(2.5)

GRAB			
BFSW-C1B4	5/13/05	6/08/05	8/26/05
TOTAL COPPER	670	690	3500
TOTAL ZINC	51	52	280
TOTAL HARDNESS	46	14	61
LAB pH	6.11	8.25	8.01
SULFATE	57	17	83

GRAB			
SW-C4	4/6/05	4/26/05	6/08/05
TOTAL COPPER	5.7	(3.1)	8.7
TOTAL ZINC	15	11	13
TOTAL HARDNESS	9.2	20	22
LAB pH	7.92	7.04	6.72
SULFATE	(4.7)	(2.8)	ND

GRAB				
SW-C6	9/15/04	10/23/04	4/26/05	6/09/05
TOTAL COPPER	34	15	14	36
TOTAL ZINC	31	70	38	32
TOTAL HARDNESS	35	82	39	31
LAB pH	6.20	6.52	7.19	6.67
SULFATE	15	14	8.7	(4.3)

GRAB									
BFSW-C1	9/16/04	FIRST FLUSH 10/22/04	COMPOSITE 10/23/04	4/26/05	FIRST FLUSH 6/07/05	6/08/05	8/27/05	FIRST FLUSH 9/19/05	9/19/05
TOTAL COPPER	1000	1000	1000	780	1800	530	2000	1400	1400
TOTAL ZINC	76	80	85	110	160	46	360	360	370
TOTAL HARDNESS	28	30	24	94	67	25	56	47	45
LAB pH	5.81	6.17	6.33	6.99	6.41	6.71	5.69	7.81	7.66
SULFATE	33	29	21	63	36	23	74	62	60

LEGEND

- EXISTING ROAD
- EXISTING BUILDING
- EXISTING WATER
- EXISTING TREE/BRUSH
- EXISTING TRAIL
- EXISTING RAILROAD
- SW-C4 ▲ SURFACE WATER SAMPLE NUMBER AND LOCATION
- BFSW-C1 ▲ BIOFILTER ASSOCIATED SURFACE WATER SAMPLE NUMBER AND LOCATION
- APPROXIMATE AREA OF RECLAIMED RAILROAD

ZINC AND COPPER WATER CONCENTRATIONS IN ug/l. HARDNESS AND SULFATE WATER CONCENTRATIONS IN mg/l.

NOTE:

1. INTERMITTENT STREAM "C" AND UNNAMED INTERMITTENT STREAM LOCATIONS ARE APPROXIMATIONS.
2. SW-C7, BFSW-C1, AND SW-C8 ARE NOT ON THE LIST IN THE WORK PLAN (8/5/04 LETTER)
3. NA = NOT ANALYZED.
4. VALUES IN PARENTHESIS ARE > OR = TO THE LOD BUT < THE LOQ.
5. ND = NO DETECT
6. * = TO DETECTION LIMIT
7. COLLECTED FROM SMALL SAMPLE COLLECTION SUMP. SUMP CONSTRUCTION MATERIALS APPEARED TO CONTAIN RESIDUAL SULFIDE BEARING MATERIALS.

FLAMBEAU MINING COMPANY

FIGURE 2
INTERMITTENT STREAM "C" MONITORING RESULTS
THRU SEPTEMBER 2005

Scale: Date: OCTOBER, 2005

Prepared By: Foth & Van Dyke By: DAT 04F003

Attachment A

Bioassessment of Stream C

Bioassessment of Stream C
Flambeau Mining Project
May 24/25, 2005

On May 24 and 25, 2005, Blue Iris Environmental, Inc. conducted a bioassessment of intermittent Stream C (Stream C). Stream C includes drainage from locations east of Highway 27 and along the west side of Highway 27. An industrial outlot and associated parking lot, reclaimed rail line and biofilter pond drain into Stream C. The industrial outlot includes the WDNR Service Center and Xcel Energy in residence of the former mine buildings. Stream C flows under Copper Park Lane from the north then takes a meandering southwest direction through woodland to the confluence with the Flambeau River immediately north of the point where Meadowbrook Creek also enters the Flambeau River.

Stream C was previously assessed on August 17 and 18, 2004. This current assessment is a complimentary assessment to the previous assessment the main difference being that the present assessment is done in the spring when there should be water flowing and representative seasonal flora and fauna should be present.

Summary of Observations

In general, the current assessment observations were nearly identical to those observed in fall 2004. The main exception is that there was a stream flow albeit quite limited and prior to the assessment, there were observed at least two species of fish present in the biofilter. One specie was the fathead minnow which, at the time of the assessment there was noted several male of the specie in breeding color and actively conducting nesting activities.

Stream Habitat and Characteristics

Stream flow upstream of Copper Park Lane is unchannelized. Obvious flow originates from the wetland area to the north and east as well as the biofilter pond. Water temperatures were highest at the biofilter outlet (70°F) with lower temperatures downstream of the culvert at Copper Park Lane. Stream flow downstream of Copper Park Lane is channelized. The upper reaches of the channelized portion is characterized by a meandering stream bed with larger rocks and small boulders in the stream bed. Except for the upper most portion of Stream C, most of the stream is wood lined and open under a mature canopy with no stream bank vegetation. In the fall 2004, the stream in places was discontinuous with interspersed gravel beds. In May of 2005, Stream C was observed to be continuous in most places though sometimes the flow passed through in-stream debris and sediment. Stream C is typically passing through a cut channel. The channel lies between one to three feet lower than the surrounding embankment. Downed timber lies in and across the stream in numerous places, which in places, restricts flow and could provide habitat for stream dwellers. In neither the fall of 2004 nor spring of 2005 was stream flow sufficient to cover even the bed of the stream throughout most of the length of the stream.

The second one third of Stream C is characterized by less rocks and boulders and appearing to be more of a flatter run. The substrate in this stretch is softer as the flow is characterized by shallow pools. Shallow pools were interrupted by downed trees and a few raised gravel beds. Pools were between three to six inches deep in the spring.

The lower one third of Stream C is characterized by steeper gradients. With the steeper gradient was observed a return to rock, cobble, and gravel reaches and a narrower stream bed.

Aquatic Vegetation

The majority of Stream C lacks any type of aquatic vegetation. The most vegetated portions of the stream occur only in the areas where the stream enters or exits the woodland. This includes the area along Copper Park Lane and the last 100 feet or so of the stream at the confluence with the Flambeau River. Even near the Flambeau River segment there is not so much in-stream vegetation as there is more of a lush vegetated plain through which the stream meanders. The only in-stream vegetation observed within the wooded segment of the stream were small patches of algae growing on the bottom of the stream in pooled areas. These algae patches were very sparse. (Attached pictures 1 and 2 show the open area of Stream C which enters the wooded canopied area and a close-up of the same area showing filamentous algal growth).

Aquatic Macroinvertebrates

Few macroinvertebrate species were observed either in the fall 2004 or spring 2005. One common species observed was the water strider (*Gerris sp.*) which was observed throughout the entire length of the stream during both seasons. Three other species observed in fall 2004 included one beetle larvae (in-stream observation), one caddisfly casing (vacated casing on submerged stone), and one Odonata exuviae on a tree about midway downstream of Copper Park Lane. In spring 2005 literally hundreds of members of the Order Ephemeroptera were observed. In addition, many caddisfly casings were observed with occupants. Several terrestrial inhabitants which were washed into the stream and drowned were observed beneath overhanging trees. These terrestrial organisms included slugs and Annelida.

Overall, the macroinvertebrate population appears very sparse. Based on the observations that the stream is discontinuous (especially during dry periods), flowing both seasonally and in specific reaches, it would seem reasonable to assume the resident population will need to have short life cycles or be adapted for life cycles which can tolerate significant time windows with little or no flowing water. The general lack of abundant populations of macroinvertebrate species will limit the ability to support other species, such as fish, which require such biota for survival.

One normally associates water quality with various types of aquatic macroinvertebrates. In particular, the presence of members of Ephemeroptera, Tricoptera, and Plecoptera is

indicative of high water quality. The observation that Ephemeroptera and Tricoptera make up a significant proportion of the insect inhabitants suggests that water quality is sufficient to support sensitive species, other conditions being satisfied.

Fish Assessment

No fish were observed in the stream during either assessments conducted fall 2004 or spring 2005. While the fall 2004 observations might have been after a prolonged dry spell, if fish use Stream C in the spring, there was no evidence of such. Temperature gradients from the culvert at Copper Park Lane to the Flambeau River were the same at each monitoring station (SP1, SP2, and SP3) – all reporting 58⁰F. While fish were observed in the biofilter (70⁰F), none were observed in Stream C. One possible reason for the lack of fish in Stream C might be the overwhelming presence of Meadowbrook Creek. Since fish normally run upstream to spawn based on both flow and temperature, Meadowbrook Creek might be both warmer and faster than Stream C to the point that Stream C is overshadowed by the presence of Meadowbrook Creek. Then too, the temperature of the Flambeau River on May 25, 2005 was 61⁰F – three degrees higher than Stream C. It is likely that neither water temperature nor flow (when flow is low) are sufficient to induce fish to migrate upstream on Stream C given conditions observed in May 2005. During periods of high flow, there is no reason to suspect that fish would not migrate upstream (or conversely migrate out of the biofilter downstream). In conversations with Jana Murphy (Kenecott Minerals onsite representative) fish were observed in Stream C in June 2005 after a period of significant rainfall.

Stream C is fully canopied. As such, if fish inhabited Stream C, cool tolerant spawning species may be favored. Warmer tolerant species would migrate up Stream C to breed in warmer pools or, if accessible, the biofilter. A lack of flow late into mid summer, as was documented during the week of September 6, 2004 would preclude inhabitation by either cool tolerant and warm tolerant species.

The potential fish cover within Stream C consists mostly of downed vegetation, rocks, and undercut banks. However, the stream appears to be completely lacking in any aquatic vegetation with the exception of the beginning channelization of Stream C near Copper Park Lane and a small portion of algae observed in the middle pool portion of the stream. Macroinvertebrates were observed in the spring though not in the fall which makes the food supply questionable for any long-term residents. The lack of vegetation and food supply would further preclude inhabitation by fish.

Based on the observed characteristic of Stream C, one would not expect to find fish in Stream C during the late summer as was observed during the August 2004 assessments. (Attached picture 3 is a typical view of a segment of Stream C)

Conclusions

On August 17 and 18, 2004 Stream C was flowing though very minimal. During observations on May 24 and 25, 2005 it was noted that flow was slightly greater than in the fall 2004, however, not sufficient to provide continuous flow throughout the entire reach from Copper Park Lane to the Flambeau River. Stream C is not a continuous flowing stream both seasonally and in portions between Copper Park Lane and the Flambeau River. Most of the feed water from Stream C is made up of unchannelized recharge from wetlands and drainage from the north and east of Copper Park Lane.

The stream appears to be very limited in biota in all aspects including aquatic vegetation, macroinvertebrate populations, and fish. Because of the seasonal flow, it is anticipated that macroinvertebrates and fish will be limited to ephemeral populations, at best, which are restricted to the high flow seasons. Fish will be more limited because of the discontinuous nature of the stream and a general lack of food and habitats. Macroinvertebrates could survive in isolated pools for extended periods of time.

Attachment A

Photo Documentation



Picture 1: Stream C immediately downstream of Copper Lane looking southwest as the stream enters the canopied section of the upper reach.



Picture 2: Close-up of Stream C at a point where it enters the canopied reach showing filamentous algal growth. Once the stream enters the woods, algae is discontinued.



Picture 3: Typical characteristic stream segment showing rock, cobble, and several obstructions which provide for discontinuous flow. Even though this is a wet period, low flow reduces habitat to small runs and shallow pools. This particular picture is in the lower 1/3 of the reach. Upper portions of the stream have greater amounts of meandering, fewer straight runs, more pooling, and more sediment deposits.